

Integration of Fast Predictive Model and SLM Process Development Chamber, Phase I

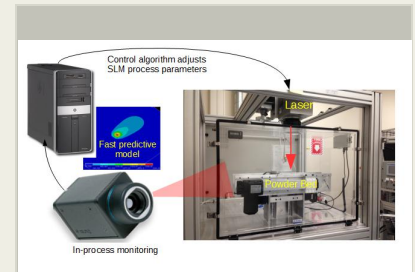
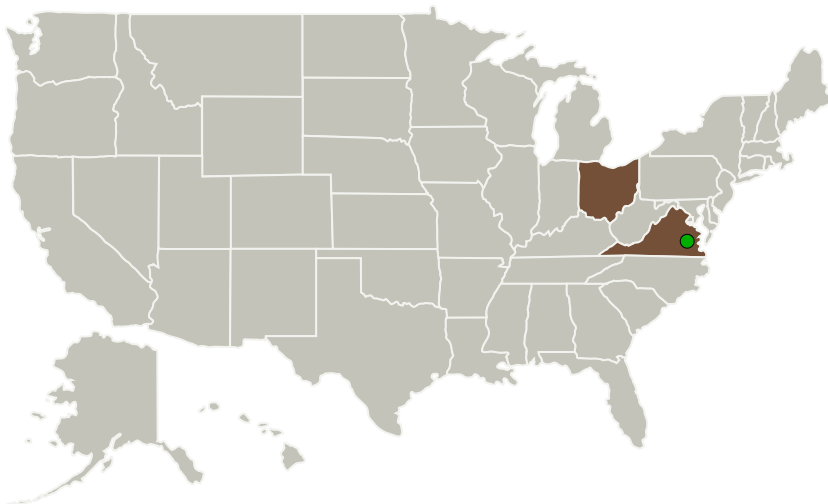
Completed Technology Project (2015 - 2016)



Project Introduction

This STTR project seeks to develop a fast predictive model for selective laser melting (SLM) processes and then integrate that model with an SLM chamber that allows full control of process variables and is equipped with in-process sensors. The combination will create a closed loop in which the model suggests process parameter settings for test builds and the sensors provide feedback to the model. This creates a powerful tool for iterative process development far faster than is currently possible by standard simulation methods and accessible to a wide range of potential SLM innovators who are not simulation specialists. The key innovation will be the development of a simple set of empirical equations that relate SLM process inputs to actual build results. This is accomplished by a combination of finite element simulations and verification experiments whose process parameters are selected by a design-of-experiments methodology. The resulting easily calculable empirical functions (a.k.a. the fast predictive model) will replace arduous simulation and undirected trial-and-error as methods of SLM process development. A user-friendly interface will be written that links the fast predictive model to sensorized SLM chamber to allow easy, rapid and flexible SLM process development. The simplicity of the system, and relatively low cost of the SLM chamber will allow large numbers of new innovators and industries to enter the field of SLM and develop novel processes that meet their application needs, as well as help solve specific problems of NASA interest. Phase I activities include 1) development of the fast predictive model, 2) development of a control algorithm and user interface linking the model to the SLM chamber, and 3) demonstration of the integrated system for rapid development of novel SLM processes.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Advratech LLC	Lead Organization	Industry	Dayton, Ohio
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
Wright State University-Main Campus	Supporting Organization	Academia	Dayton, Ohio

Primary U.S. Work Locations	
Ohio	Virginia

Project Transitions

▶ **June 2015:** Project Start

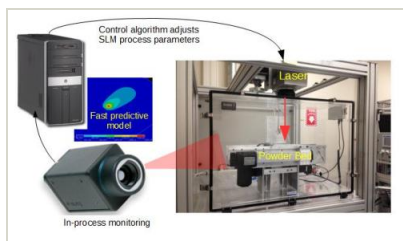
✓ **June 2016:** Closed out

Closeout Summary: Integration of Fast Predictive Model and SLM Process Development Chamber, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/139133>)

Images



Briefing Chart Image

Integration of Fast Predictive Model and SLM Process Development Chamber, Phase I
(<https://techport.nasa.gov/image/128809>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Advratech LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

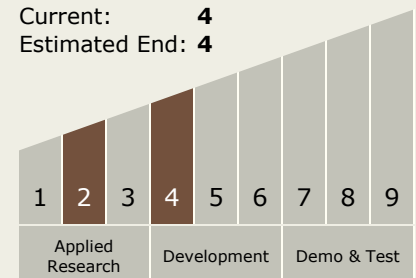
Carlos Torrez

Principal Investigator:

Ahsan Mian

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.2 Intelligent Integrated Manufacturing

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System